21.

$\frac{dy}{dt} = my$ $\quad y = y_0 e^{mt}$

$\int \frac{dy}{y} = \int m\,dt$

$\ln|y| = mt + c$

$y = e^{mt+c}$

$y = e^{mt} \cdot e^{c}$

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22. $f(x) = -x^6 + x^3 - 2$

decreasing - $f' < 0$

$f'(x) = -6x^5 + 3x^2 < 0$

$x^2(-6x^3 + 3) < 0$

$-6x^3 + 3 < 0$

$-6x^3 < -3$

$x^3 > \frac{-3}{-6}$

$x^3 > \frac{1}{2}$

$x > \sqrt[3]{\frac{1}{2}}$

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24. $0 \le t \le 4$ $v = t^3 - 4t^2 - 3t + 2$

min accel. $a = 3t^2 - 8t - 3$

$a' = 6t - 8 = 0$

$t = \frac{8}{6} = \frac{4}{3}$ min at

$a\left(\frac{4}{3}\right) = 3\left(\frac{4}{3}\right)^2 - 8\left(\frac{4}{3}\right) - 3$

$= 3 \cdot \frac{16}{3^1} - \frac{32}{3} - \frac{9}{3}$

$-\frac{25}{3}$

$a'' = 6 > 0$ (++ ∪)

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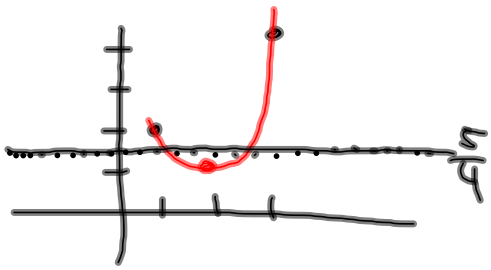
26. $f(x) = \frac{5}{4}$

x	1	2	3
f(x)	2	k	4



$k < \frac{5}{4}$

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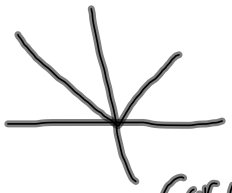
Review 5 Differentiability & Continuity

Differentiable: derivative exists
(can draw a tan line)
smooth, not pointy
locally linear

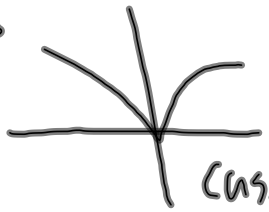
not differentiable

$y = |x|$



corner

$y = x^{2/3}$



cusp

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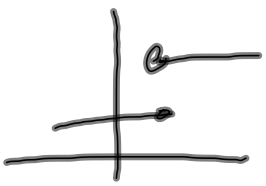
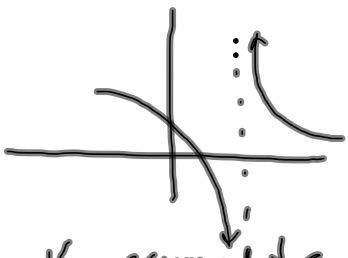
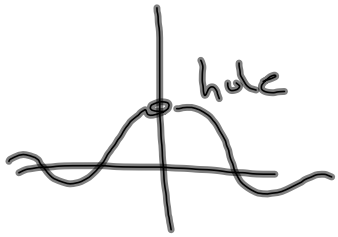
If f is not continuous then
it is not differentiable



gap
jump



v. asymptote



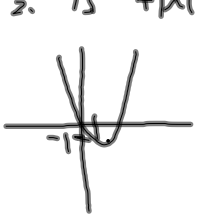
hole

If f(x) is differentiable then
it is continuous

Mar 8-8:26 AM

$f(x) = x^2 - 2x$

1. Is $f|x|$ continuous at $x=0$? yes
2. Is $f|x|$ differentiable at $x=0$? NO



$|0|^2 - 2|0|$

$|x|^2 - 2|x|$

$|x|(|x| - 2)$

two points

continuous

1. $\lim_{x \to 0^+} |x|^2 - 2|x| = 0$

   $\lim_{x \to 0^-} |x|^2 - 2|x| = 0$

   $\Big\}$ equal, $\lim_{x \to 0}$ exists

2. $f(0) = 0$

3. $\lim_{x \to 0} f(x) = f(0)$

Mar 8-8:28 AM